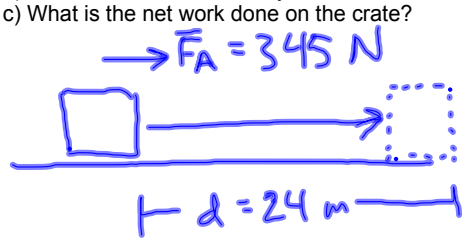
HW: p. 162: 1, 2

p. 166: 3, 4

A worker pushes a 1500 N crate with a horizontal force of 345 N a distance of 24.0 m. Assume the coefficient of kinetic friction between the crate and the floor is 0.220.
a) How much work is done by the worker on the crate?
b) How much work is done by the floor on the crate?
c) What is the net work done on the crate?

$\mu_k = 0.22$



$\theta_A = 0°$

a) $W_A = F_A d \cos\theta_A$

$= (345\text{ N})(24\text{ m})\cos(0°)$

$= 8280$ J

$\theta_f = 180°$

b) $W_f = F_{fk} d \cos\theta_f$

$= (330\text{ N})(24\text{ m})(-1)$

$= -7920$ J

$F_{fk} = \mu_k F_N$

$= (.22)(1500\text{ N})$

$= 330$ N

c) $W_{net} = W_A + W_f$

$= 8280\text{ J} - 7920\text{ J}$

$= 360$ J

$W_{net} = \Sigma F d \cos\theta$

Types of Energy and Examples:

- Brainstorming:

1 - Mechanical
- Elastic
2 - Nuclear
- Internal
3 - Chemical
- Radiant
- Potential
- Hydro
- Kinetic
5 - Electrical
4 - Thermal
- Magnetic
- Stored

"Official"	Example
Mechanical	gears in a watch
Nuclear	bomb, Sun
Chemical	gunpowder, battery
Thermal	radiator
Electromagnetic	magnets, electricity, lightning

Mechanical Energy:

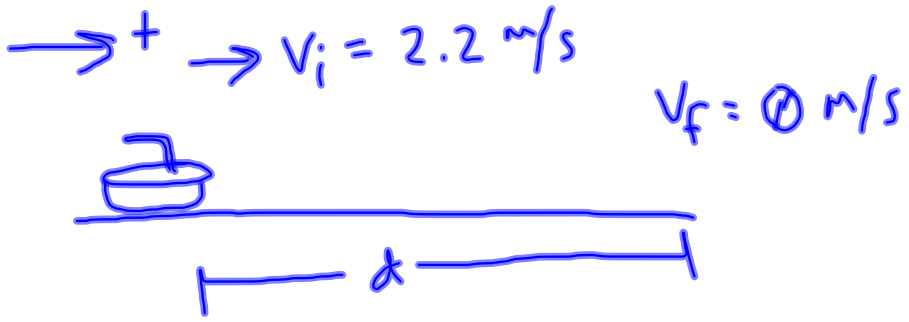
- Kinetic energy
  - energy associated with moving objects
  - $K = \frac{1}{2}mv^2$
    - K: kinetic energy (scalar)
    - m: mass (scalar)
    - v: magnitude of velocity (scalar)
- Gravitational Potential Energy
  - energy associated with a difference in height from the zero point
  - $U_g = mgh$
- Units: Joules
- Total Mechanical Energy

$$E_{total} = \Delta K + \Delta U_g$$
$$= (K_f - K_i) + (U_{gf} - U_{gi})$$
$$= \left(\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2\right) + (mgh_f - mgh_i)$$

Relationship Between Work and Energy:

- Work - Energy Theorem
  - Takes energy to do work
  - $W = \Delta E$
    $= \Delta K + \Delta U_g$

On a frozen pond, a person slides a 10.0 kg curling stone, giving it an initial speed of 2.2 m/s. How far does the curling stone move if the coefficient of kinetic friction between the curling stone and the ice is 0.10?



$$W = \Delta E$$

$$= \Delta K + \Delta U_g \quad (\Delta U_g = 0)$$

$$= K_f - K_i \quad (K_f = 0)$$

$$F_{fk}\, d \cos\theta = -\frac{1}{2} m v_i^2$$

$\vec{F}_{fk}$ and $\vec{d}$ point in opposite directions, $\theta = 180°$

$$d = \frac{-m v_i^2}{2 F_{fk} \cos\theta}$$

$$= \frac{-(10\text{ kg})(2.2\text{ m/s})^2}{2(9.8\text{ N})\cos(180°)} \qquad F_{fk} = \mu_k F_N$$

$$= 2.47\text{ m} \qquad F_N = (.1)(10\text{ kg})(9.8\text{ m/s}^2) = 9.8\text{ N}$$